Influence of different suturing techniques on periodontal health of the adjacent second molars after extraction of impacted mandibular third molars

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Objective. The objective of this randomized controlled trial was to compare the effects of different suturing techniques (simple loop suture vs. anchor suture) on the periodontal health of the adjacent second molars after impacted mandibular third molar extraction.
Study design. Fifteen patients with bilaterally identical impacted mandibular third molars were used. Using split-mouth design, flaps were closed with either anchor suture technique or simple loop suture technique after the extraction of third molars. Postoperative examination included probing pocket depth (PPD) and clinical attachment level (CAL) measured at the distal surface of the second molars before surgery and 6 months after surgery.
Results. The PPD and CAL in the distal surfaces of the second molars were significantly higher after 6 months in the simple suture group ($P = .001$), whereas no differences were found in the anchor suture group ($P > .05$). Intergroup comparisons showed that the 6-month PPD and CAL values of the distal surfaces were significantly higher in the simple suture group compared with the anchor suture group ($P = .015$).
Conclusion. The results suggest that anchor suture might be a better technique to use to maintain healthy periodontium and to prevent periodontal problems after the extraction of impacted third molars. **(Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2009;108:156-161)**

Third molars, the last teeth to erupt into the human dental arch, are the most frequently impacted teeth in all human populations.[1] This impaction, which is probably the result of both genetic and environmental factors,[2] causes a variety of complications, such as pericoronitis, root resorption of the adjacent tooth, cystic and neoplastic changes, orthodontic problems, prosthetic problems, and even temporomandibular joint symptoms.[3-9] Therefore, removal of the third molar is one of the most common surgical procedures in the oral cavity, and the optimal management of impacted mandibular third molars is still challenging for clinicans.

Another important complication to address is the risk of developing periodontal defects on the distal aspect of second molars after third molar extraction.[10] Several reports have been published documenting the frequency, incidence, and risk factors for second molar periodontal pockets, such as age, inclination of third molar, large contact area, visible plaque distal to the second

molar, and pathologically widened follicle of third molar after third molar removal.[1,11-13] As a result of earlier studies, it has been suggested that persistent local periodontal problems constitute a potentially sizeable problem or postoperative complication and a few possible risk indicators for these residual periodontal pockets have been identified. Different incisions and flap techniques have been proposed in these third molar surgeries to offer a better surgical field, to prevent these periodontal problems, and to minimize postoperative discomfort for the patient.[14-19] However, studies have documented conflicting results.

It is known that primary closure of the flap avoids suture dehiscence and improves wound healing.[17] The simple loop suture (interrupted interdental button or single button) is a very widely used suturing technique usually preferred by surgeons evaluating the effect of third molar removal on the periodontal health of the adjacent second molar.[18-21] The anchor suture is another suturing technique to close a flap located in an edentulous area mesial or distal to a tooth. It is best used in mesial or distal wedge procedures. This suture closes the facial and lingual flaps and adapts them tightly against the tooth.[22] From this point of view, it was hypothesized that anchor suture might provide better periodontal healing adjacent to the second molars after third molar surgery. To the best of our knowledge, no studies have evaluated the effect of this suturing

technique regarding periodontal health status of second molars. Therefore, the aim of the present randomized controlled trial was to compare the effects of 2 different suturing techniques (simple loop suture vs. anchor suture) used during impacted mandibular third molar extraction on the periodontal health of the adjacent second molars regarding probing pocket depth (PPD) and clinical attachment level (CAL).

MATERIAL AND METHODS

A total of 15 patients, 16-21 years of age, with bilaterally identical impacted mandibular third molars were used for the study. Panoramic radiographs were taken to assess third molar eruption and angulation versus the adjacent second molar. Inclusion criteria for the study group were: totally bone-impacted mandibular third molar with mesioangular or vertical classification and requiring ostectomy and odontotomy; age <25 years; nonsmoker; no systemic diseases and good general health; no pregnancy or lactation; no medication in the last 6 months that could influence wound healing after surgery; no inflammation, such as acute pericoronitis or periodontal disease, in the oral cavity. Third molar removal was prompted by prophylactic and orthodontic considerations. The patients satisfying the inclusion criteria were recruited by 1 research group member (M.S.) to participate in the study.

Before the surgical procedure, each patient was informed about the surgery, postoperative recommendations, and possible complications and signed a consent form indicating his or her agreement to participate in the study. The study protocol and consent form were approved by the university Institutional Review Board with the protocol no. 2007/2.

Preoperative examination

An alginate impression of the mandible was taken for fabrication of an acrylic stent which was used as a probing guide for examination of the second molars before and after surgery. The periodontal parameters of the subject tooth indicating its periodontal status were PPD and CAL measured on the distal surface of the second molars. The PPD is the distance from the gingival margin to the bottom of the gingival pocket, and the CAL is the distance in millimeters from the cementoenamel junction to the bottom of the probable gingival pocket. All sites were measured by 2 experienced examiners (B.C. and F.P.), who were blinded to the group assignment, using a Williams periodontal probe (Hu-Friedy Instrument Co., Chicago, IL) to assess interexaminer reproducibility. Reproducibility of the clinical examination was assessed by calculating the percentage agreement ± 1 mm between the 2 sets of data recorded by the 2 examiners.[1]

Surgical procedure

All operations were done under local anesthesia by the same oral surgeon (E.O.S.) in the same operating room and under similar conditions. Analgesia was achieved by an inferior alveolar and buccal nerve block, together with infiltration of the mucosa of the retromolar trigone with articaine containing 1:100.000 epinephrine (Ultracaine DS; Aventis, Istanbul, Turkey). A full-thickness incision was made to prepare the 3-cornered flap. It consisted of a horizontal incision in the mandibular ramus and a sulcular incision starting near the mesiobuccal edge of the second molar and extending to its distal surface. A relieving incision was made in the mesial region without cutting the interdental papilla. The horizontal incision was terminated at the distal surface of the distobuccal cusp of the mandibular second molar.[19]

Minimum ostectomy and tooth sectioning were performed with a rotary instrument under constant irrigation with sterile saline. After removal of the tooth, the extraction socket was cleansed carefully, including removal of follicular remnants. No subgingival scaling or root planing on the distal surface of the second molar was attempted after the extraction. Using a split mouth design, the distal surface of the flaps were closed with anchor suture technique in one site and simple loop suture technique in the other site using 3-0 silk sutures. The needle was placed at the line-angle area of the facial or lingual flap adjacent to the tooth, anchored around the second molar tooth, passed beneath the opposite flap, and then tied in the anchor suture technique (Fig. 1). The needle penetrates the outer surface of the first flap, the undersurface of the opposite flap is engaged, and then the suture is brought back to the initial site where the knot is tied in the simple suture technique (Fig. 2). The half-mouth segment randomization was performed before surgery, according to the flip of a coin by 1 research group member (F.M.); the surgeon was unaware of group until suturing.

All patients received postoperative instructions (ice packs for 6 h after surgery, alternating 30 min of application with 30 min pause, soft warm diet for the first 24 h, normal oral hygiene from the day after surgery, mouthwash with 0.2% chlorhexidine twice daily). Patients were given antibiotics (amoxicillin 2 mg per day for 5 days) and analgesic drugs (flurbiprofen 200 mg per day for 3 days). The length of the operation was also noted.

Postoperative examination

A postoperative examination evaluated the periodontal health of the adjacent second molar. Clinical examinations were carried out at 6 months after third molar surgery. The periodontal parameters (PPD and CAL)
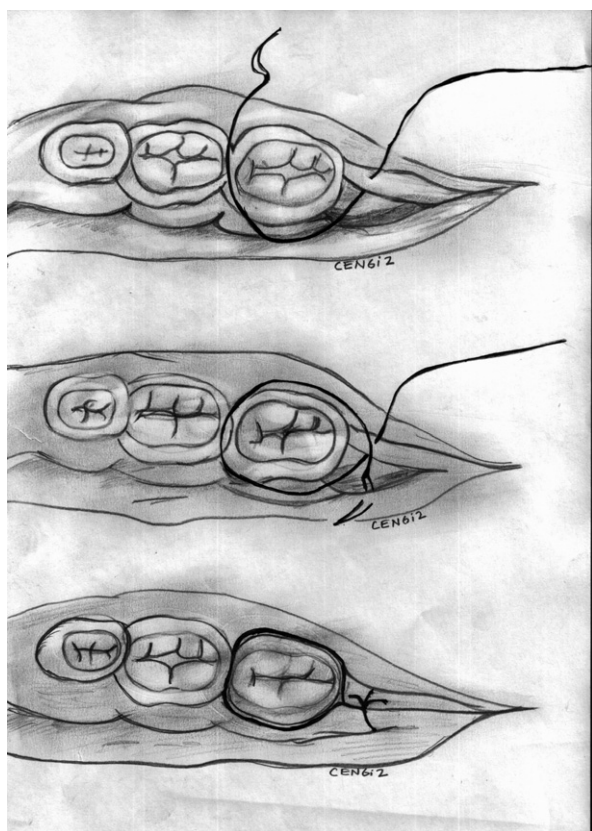
Fig. 1. Schematic illustration of the anchor suture technique. The needle is placed at the line-angle area of the facial or lingual flap adjacent to the tooth, anchored around the tooth, passed beneath the opposite flap, and tied.
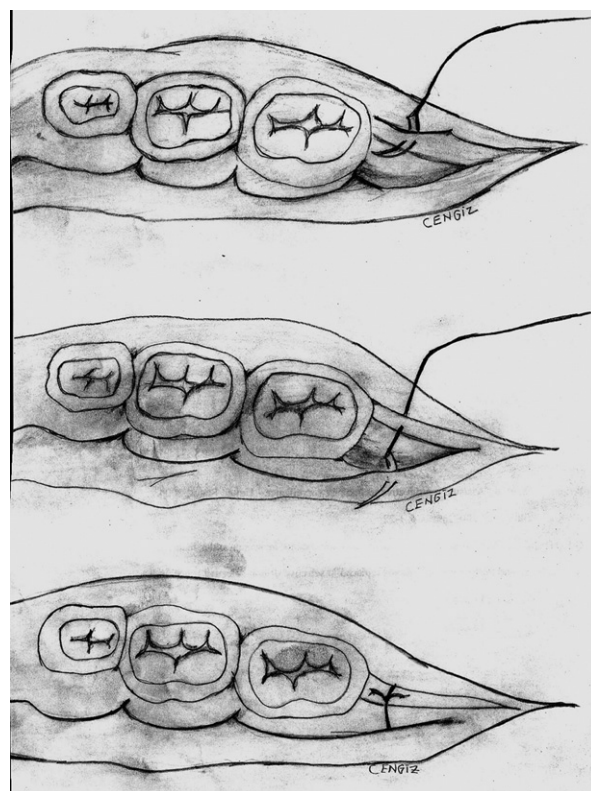

Fig. 2. Schematic illustration of the simple loop suture technique. The needle penetrates the outer surface of the first flap, and the undersurface of the opposite flap is engaged; then the suture is brought back to the initial side, where the knot is tied.

indicating the periodontal health of the second molar were recorded as in the preoperative examination.

Statistical analysis

Normalities of distributions were tested by the Shapiro-Wilks procedure. Wilcoxon signed ranks nonparametric test was used for intergroup and intragroup comparisons in which the parameters were not in accordance with normal distribution. These analyses were performed using the SPSS statistical software package (version 15.0; SPSS, Chicago, IL). Also, NCSS 2004 and PASS 2005 statistical program packages were used for power anaysis of Wilcoxon signed ranks nonparametric test. Minimum sample size was calculated as 9 with alpha $= 0.05$ and beta $= 0.20$ for at least 0.80 power of the study. The sample size for the study was increased to 15 to tolerate the possibility of missing data. The data are expressed as mean $\pm$ SD and median (minimum-maximum). When *P* was $<.05$, the difference was considered to be significant.

RESULTS

Fifteen patients completed the postoperative follow-up without any significant complication. A total of 30 impacted molars were removed. The mean age of the patients was 18.53 ± 1.60 (range 16-21) years. The mean surgical time was 16.07 ± 3.08 (range 12-22) minutes and was similar for both suture techniques studied ($P > .05$); as a result, there were no significant differences in the difficulty of the cases.

Periodontal findings

The periodontal conditions of the second molar before surgery and 6 months after surgery are summarized in Table I. The percentage agreement $\pm$ 1 mm for PPD and CAL measurements of the second molars was 100%.

In brief, the PPD and CAL values measured on the distal surface of the second molar before surgery were similar in both anchor suture and simple loop suture groups ($P > .05$). Statistically significant increases of the distal PPD and CAL were found at 6 months in the

Table I. The probing pocket depth (PPD) and the clinical attachment levels (CAL) values measured on the distal surface of the second molar before surgery and 6 months after surgery

	Preoperative*	6 months
Distal PPD (mm)		
Anchor suture	2.87 ± 0.52	3.0 ± 0.76§
	3 (2-4)	4 (2-4)
Simple suture	2.93 ± 0.70	3.93 ± 0.70†‡
	3 (2-4)	4 (3-5)
Distal CAL (mm)		
Anchor suture	3.20 ± 0.56	3.67 ± 0.98§
	4 (2-4)	4 (2-5)
Simple suture	3.13 ± 0.74	4.67 ± 0.82†‡
	4 (2-4)	5 (3-6)

Values are mean ± SD and median (minimum-maximum).
*No significant difference in the preoperative values between the groups ($P > .05$).
†Significantly higher 6-month postoperative values in the simple suture group compared with the anchor suture group ($P = .015$).
‡Significantly different from the preoperative values of both groups ($P = .001$).
§No significant difference from the preoperative values of either group ($P > .05$).

simple suture group compared with the preoperative values ($P = .001$), whereas there were no significant differences in these values for the anchor suture group ($P > .05$). Intergroup comparisons showed that the 6-month PPD and CAL values of the distal surface were significantly higher in the simple suture group compared with the anchor suture group ($P = .015$; Table I).

DISCUSSION

This study compared the effects of 2 different suturing techniques, simple loop suture and anchor suture, after removal of impacted third molars on the periodontal health of the adjacent second molars. The statistical results showed that the 6-month PPD and CAL measured on the distal surface of the second molars were significantly higher in patients with simple loop suturing compared with anchor suturing after third molar removal. Thus, the anchor suture seemed to provide a better spontaneous periodontal healing on the adjacent second molar after extraction of the impacted third molar, even without any intraoperative periodontal treatment.

The simple loop suture is accepted as a traditional suturing technique which is commonly used by surgeons in studies evaluating the effect of third molar removal on the periodontal health of adjacent second molar.[18-21] On the other hand, the anchor suture has been reported as one of the best suturing techniques to close a flap located in an edentulous area mesial or

distal to a tooth.[22] However, there is no report documenting the effect of this suture technique in third molar surgery. From this point of view, this is the first clinical trial comparing the effects of these 2 different suturing techniques on the periodontal health of the adjacent second molars after the extraction of impacted third molars.

Because localized periodontal lesions may remain symptomless until the periodontal attachment loss is very advanced, they may easily escape detection by the patient and an attending dentist. This potentially creates a threat to the involved second molar.[1] So far, only a few groups of researchers have studied the periodontal consequences,[11,13,23,24] tried to control the periodontal disease,[25] or tried to improve the periodontal healing[26] after the surgical removal of impacted mandibular third molars.[1] Most clinical studies have found an increase in pocket depth and a bony defect on the distal surface of the second molar after third molar removal.[14,27] Kugelberg et al.,[11] in a retrospective study, found that 43.3% of the cases had probing depths of 7 mm or more and 32.1% had intrabony defects of 4 mm or more on the distal aspect of the adjacent second molar 2 years after lower third molar surgery. Also, a relatively high prevalence of deep residual periodontal defects at the distal surface of the mandibular second molar after the extraction of the adjacent third molar was found in a cross-sectional study,[23] which is in accordance with the other studies already described. On the other hand, Groves and Moore[28] found a decreased pocket depth on the second molar after removal of the third molar. Our clinical measurements showed that at 6 months, significant increases in PPD and CAL of the distal surfaces were found only in the simple suture group, whereas 6-month PPD and CAL values were not significantly different in the anchor suture group compared with the preoperative values. Stephens et al.[29] reported an improvement in PPD after 3 months without documentation of the 6-month results. On the other hand, in a recent clinical study, the measurements of PPD, CAL, and BL (bone level) were found to be greater at 6 months after the procedure compared with 3 months, suggesting that the periodontal health of second molars tends to deteriorate with time.[14,30] Therefore, it is important to perform clinical examination at 6 months to enable sufficient time for postextraction hard and soft tissue healing to have occurred.

It has been suggested that increased second molar pocket depth might be related to the ostectomy procedure.[31] Moreover, some authors believe that flap design and patient age might also have effects on the second molar periodontal status. Several publications showed an enhanced regrowth of the alveolar bone crest in young patients when the development of the removed

third molar was not yet complete.[32,33] Likewise, in another clinical study patient age was reported to be an important factor for periodontal complications after extraction of impacted third molars, with younger patients healing better than older patients.[13] Kugelberg et al.[24] found that deeper periodontal pocket depth after third molar surgery is 3 times more frequent in people who are >25 years old. Also, it has been suggested that generalized inflammation due to periodontal disease can complicate the postoperative periodontal healing of the second molar after third molar extraction.[27] Because the patients in the present comparative study were between 16 and 21 years of age, had no periodontal disease before surgery, and all of the surgeries included the ostectomy procedure, these reported variables probably did not interfere with the results.

No additional benefits for the mandibular second molars have been found when the teeth were root planed right after the surgical removal of the adjacent third molar. This treatment might engender false security among dental practitioners regarding the prevention of residual periodontal problems persisting on mandibular second molars after third molar extraction.[34] In a review, it was concluded that healthy periodontal status might worsen to periodontal disease after the extraction of third molars, whereas in the presence of periodontal disease the overall periodontal health on the distal of second molar might improve after third molar removal.[10] That review is somewhat inconsistent with the present findings, in which healthy periodontium was maintained after 6 months in the anchor suture group.

The periodontal problems in the second molars are still an important complication after the extraction of the impacted third molars; therefore, the optimal surgical approach to prevent these defects is still under investigation. We compared for the first time the efficacy of the anchor suture technique with that of the simple loop technique in maintaining the periodontal health of the mandibular second molar after removal of the adjacent impacted third molar in younger patients with healthy periodontium. In the statistical comparisons of the present study, anchor suture technique seems to provide a better spontaneous periodontal healing of the second molar after extraction of the impacted third molar without any periodontal treatment. On the other hand, it is also important to discuss clinically significant differences as well as statistical ones. Although the 6 month PPD and CAL values were found to be statistically higher in the simple suture group, the actual measured differences were <1 mm, suggesting that the effects of the 2 suturing techniques on the periodontal health of the second molar after third molar removal might not be accepted as clinically significantly different. Although we can speculate that anchor suture might be used as an alternative technique to maintain the healthy periodontium and to prevent the periodontal problems after the extraction of the impacted third molars, the clinicians can feel free to choose the suturing technique that works best in their hands until the efficacy of anchor suturing technique is proven by further controlled studies in the larger patient groups.

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